NPIC/P&DS/D/6-1613
5 October 1966

MEMORANDUM FOR: Chief, Exploitation Systems Section, DB, P&DS
25X1 ATTENTION : [redacted]

THROUGH : Chief, Development Branch, P&DS

SUBJECT : Laser Rear Projection Viewing System

REFERENCE : NPIC/P&DS/D/6-1575, Memo Regarding Subject, dated 15 September 1966

1. The reference memorandum discusses a proposal by [redacted] 25X1
25X1 [redacted] to study the feasibility of developing the subject viewing system. On the basis of the reference memorandum a visit to [redacted] 25X1
25X1 [redacted] was arranged for [redacted] and myself to evaluate the status of their development in this area.

2. On 30 September 1966 we visited [redacted] at the 25X1
25X1 [redacted] and viewed the [redacted] broad-band monochromatic laser-scanning display system they are developing for [redacted] 25X1 The performance of this device was both encouraging and disappointing. It was encouraging in that it demonstrated the basic feasibility of producing a real-time display with scanned laser illumination at television bandwidths. It was disappointing in that the demonstrable performance was considerably more limited than had been described. [redacted] explained 25X1 that this was due primarily to the Fiber Optic Scan Converter and the temperature sensitivity of the galvanometer type scanning component. This display performance was deficient in terms of resolution (approximately 5 lines per inch), size of display (about 8 x 10 inches), and non-uniformity of the displayed image.

3. In spite of these deficiencies, the coming feasibility of such wide bandwidth scanning light beam displays was definitely established.
25X1 [redacted] has accomplished the development of a very efficient wideband modulator and a very advanced scanning system. It appears that in a relatively short time these techniques will be developed into a performance capability which is highly competitive with the cathode ray tube. It appears even now that the system could be used for illuminating a contact-type light-modulating printer or viewer. However, the color of

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the laser illumination, which in this case was blue-green, may preclude operational acceptability of this system as a source of illumination for
25X1 film viewing. [redacted] informed us that development of gas lasers of the Argon and Krypton variety is proceeding very rapidly and that laboratory models of the Krypton laser produce a total of 5 watts energy in 3 beams corresponding effectively to the primary colors and thereby giving an impression of white light.

4. The net effect of the [redacted] visit was to convince 25X1
me that a modulated laser-scanning display system is an operational reality and that its practical application is not far away. However, it is also obvious that there are many problems to be solved before an operationally acceptable device employing this type of illumination can be developed. This fact makes it all the more imperative that we define the requirement for such a device before we invest in the development of techniques for accomplishing it. So my original recommendation, with respect to your suggestion in the reference memorandum, still stands. I do not feel that we should consider supporting any development of the [redacted] 25X1
laser-scanning technology at this time. However, I certainly recommend that we keep aware of their progress in this field. I believe that our development of the light modulation viewer should proceed from the human factors standpoint to determine the nature and extent of the benefits (if any) and limitations of such a viewing technique.

25X1

[redacted]
Deputy Chief, Development Branch, P&DS

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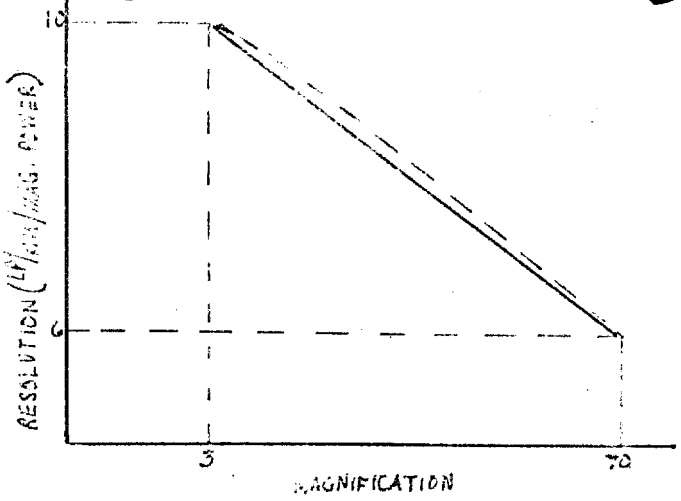
ADDITIONAL SPECIFICATIONS TO BE INCLUDED IN THE DEVELOPMENT OF AN ADVANCED REAR-PROJECTION VIEWER.

1. Semi-Automatic film loading. The operator simply loads the film spool in the transport and attaches the end of the film to a device which then carries it through the projection platen to the take up spool. The take up spool can be a special design; however, no adjustments should be required to accommodate various film sizes. The removal of the take up spool will not be required i.e., a fixed film clamping take up spool would be acceptable.

2. Film Positioning. The mid-point of all the various film widths will always be positioned at the mid-point of the film projection gate.

3. The resolution requirements are 10 lp/mm/magnification power 3X and 6 lp/mm/magnification power @ 70X using a high contrast resolution target. These values are to be read on the viewing side of the screen and should not vary more than 20% over the entire screen. The resolving power should be no less than shown in Figure 1 (solid line) below.

It should exhibit no less than a linear decrease between the maximum and minimum points. There is no objection to the curve being concave downward as shown dotted below.



4. Maximum acceptable film temperature in the film gate is 100°F when used in an ambient room temperature of 80° or below. Temperature tests will be made with silver halide film, in a static state, with a fogged density of 1.5, completely filling the entire gate, with the light source burning continuously at maximum brightness for three hours.

5. The film aperture shall measure no less than 9.5" X 9.5". The entire width of the 9.5 inch wide film will be projected.

6. The imagery shall automatically be in focus at any magnification either in the static viewing mode or in the transport mode. This requirement does not apply to the high speed slew mode; however, the operator must be able to scan the film at a selected rate (depending on the magnification) with the entire projected image remaining in sharp focus. The necessity for manual focus adjustment when changing from the static to the dynamic viewing mode will not be required, nor will a focus adjustment be required when the magnification is varied. A focus adjustment is permitted for emulsion up or down variations and initial loading.

7. Screen Brightness. The screen brightness, as viewed from the position of the observer, will have a minimum acceptable luminance of 20ft.-lamberts at any magnification. This luminance will be measured with a film of neutral density (1.5) filling the film plane. The screen will be evenly illuminated and at no point will the illumination deviate by more than 10%. This brightness requirement will not be obtained from 3X to 3.7X in the one inch square area at the corners of the screen. It is required that the light intensity be continuously variable from 100% to 50% of the above values. The color temperature of the illumination shall never fall below 3400°K. The brightness of the original light source shall not diminish by more than 10% during the first 1000 hours of operation.

8. Film Damage. There will be absolutely no damage to the film either in the static or dynamic conditions.

9. Distortion. The optical system is to be so designed that when the image is in sharp focus there will be no apparent color fringing on the screen when the screen is inspected with a 10X magnifier when a calibrated grid is projected; geometric distortion of the images at the screen shall not exceed 2 per cent.

10. Safety. The xenon arc lamp shall be adequately enclosed to completely protect the operator from a possible explosion of the lamp.

11. Joystick Motion and Positioning. Push button controls shall be provided to automatically center the projection system over the mid-point of the film. Another push button control shall provide

automatic image rotation to a reference position. The joystick motion control shall be extremely sensitive -- the film speed will not vary when the joystick is positioned at a constant deflection. The null position shall be positive and limited in range. The joystick control assembly shall be removable from the viewer to permit the operator to control the image motion at a distance up to 4 feet away from the viewer.

Please see me on this.

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ITEM # 17 Internal and external coordination is being maintained to insure that there is no duplication of effort within the Community

NAVAIR	4 OCT 1966	NEGATIVE
NAVC	7 " "	"
GIMRADA	10 OCT 1966	"